

Be Most Wary of Nature's Own Pesticides

By BRUCE N. AMES

The bad news is that our plant foods contain carcinogens. Carrots, comfrey tea, celery, parsley, parsnips, mushrooms, cabbage, Brussels sprouts, mustard, basil, fennel, orange and grapefruit juices, pepper, cauliflower, broccoli, raspberry and pineapple contain natural pesticides that cause cancer in rats or mice and that are present at levels ranging from 70 ppb (parts per billion) to 4,000,000 ppb—levels that are enormously higher than the amounts of man-made pesticide residues in plant foods.

All plants produce their own natural pesticides to protect themselves against fungi, insects and predators such as man. Tens of thousands of these natural pesticides have been discovered, and every species of plant contains its own set of toxins, usually a few dozen. When plants are stressed or damaged, such as during a pest attack, they increase their natural pesticide levels many fold, occasionally to levels that are acutely toxic to humans.

Only a tiny percentage of these natural pesticides has been tested in animal cancer tests, but of those that have been tested, the percentage that turns out to be carcinogenic is about as high as for man-made pesticides (about 30%). The same appears to be true for natural teratogens (agents that cause birth defects). It is highly probable that almost every plant product in the supermarket contains natural carcinogens and teratogens.

The pesticides that we are eating are 99.99% all natural (we eat 10,000 times more natural than man-made pesticides). Most natural pesticides, like man-made pesticides, are relatively new to the modern diet, because most of our plant foods were brought to Europe within the last 500 years from the Americas, Africa and Asia (and vice versa).

In response to the environmentalist

campaign about tiny traces of man-made pesticides, plant breeders are active in developing varieties that are naturally pest resistant. However, the primary way plant breeders are able to increase natural resistance to pests is to breed plants with increased levels of natural pesticides. It should be no surprise, then, that a newly introduced variety of insect-resistant potato had to be withdrawn from the market, due to acute toxicity to humans caused by much higher levels of the teratogens solanine and chaconine than are normally present in potatoes. Similarly, a new variety of insect-resistant celery recently introduced in the United States had to be withdrawn after it caused widespread outbreaks of dermatitis due to a concentration of carcinogens at 9,000 ppb rather than the usual 900 ppb.

Many more such cases are likely to crop up—they are undetected as yet due to lack of immediate observable effects—because there is a fundamental trade-off between nature's pesticides and man-made pesticides.

The good news is that it now appears from much recent work on the mechanisms of carcinogenesis that the risk of cancer is negligible from carcinogens at levels far below the maximum tolerated dose given to rats and mice in cancer trials. I am not even very concerned about the cancer risk from allyl isothiocyanate, a natural carcinogen present in cabbage at 40,000 ppb and in brown mustard at 900,000 ppb, because I, along with most other leading scientists, am very skeptical about all of these worst-case, low-dose extrapolations from high-dose animal tests.

What must be emphasized is that "the dose makes the poison." For example, consuming five alcoholic drinks per day is clearly a risk factor in humans for cancer, and in pregnant women for giving birth to mentally retarded babies. However, there is no convincing evidence as yet that

consuming one alcoholic drink per day is dangerous. As another example, sunlight can cause cancer, but the evidence suggests that the carcinogenic danger is from repeated sunburns. In fact, ultraviolet light at low doses induces a tan, which protects against the burning of skin by ultraviolet light.

My own estimate for the number of cases of cancer or birth defects caused by man-made pesticide residues in food or water pollution—usually at levels hundreds of thousands or millions of times below that given to rats or mice—is close to zero.

The Food and Drug Administration and the Environmental Protection Agency are doing an adequate job of protecting our food supply from carcinogenic contaminants and are much more credible than the activists lawyers with the Natural Resources Defense Council who spend their time wooing the media with scientifically unfounded claims about the dangers of pesticides, but who have never assembled a knowledgeable board of scientific advisers. The cost to the American public from such misplaced efforts is enormous, both in terms of a very large hidden tax on our economy and in terms of lives lost by diverting our resources from real public-health problems.

In order to minimize cancer and the other degenerative diseases of aging (which are associated with our constantly increasing life expectancy), we need the knowledge that will come from further basic scientific research. Yet we are spending \$70 billion per year on pollution because of wildly exaggerated fears and only \$9 billion per year on all of our basic scientific research.

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